REMARKS

In the Office Action of July 30, 2003, Claims 27-43 were rejected under 35 U.S.C. § 112, second paragraph, as incomplete for omitting an element. The Office Action asserted that the omitted element is the element used to perform the function of blocking current flow and the omitted structural cooperative relationships are the relationships of such element with the layers of the semiconductor structure, the distributed feedback grating, and the distributed Bragg reflector grating.

By definition, a distributed Bragg reflector grating is outside the gain section of a semiconductor laser with no current flow therethrough so that the gratings act as simple reflectors. See, e.g., the Authoritive Dictionary of IEEE Standards Terms, 7th Ed. IEEE Press: Standards Information Network, Piscataway, N.J., 2000 (copy of printout enclosed). Thus, it is redundant to specify structure blocking current flow through a distributed Bragg reflector since that is by definition a feature of a distributed Bragg reflector. Nonetheless, to satisfy the objection made by the examiner, the claims have been amended to specify that the distributed Bragg reflector gratings include means for blocking current flow through the distributed Bragg reflector gratings. That means can include a layer of insulating material, back biased junctions, or any other structure which is utilized for the purpose under the definition of a distributed Bragg reflector grating. Thus, it is requested that the objection under 35 U.S.C. § 112 be withdrawn.

A question was raised in the Office Action as to what is the "longitudinal direction." It is submitted that the longitudinal direction in semiconductor lasers is a standard term and refers to the direction in which light reflects back and forth within the laser cavity to result in lasing action. A distributed feedback grating in a semiconductor laser necessarily extends in a longitudinal direction. However, to make explicit that which was implicit in the claim as presented, Claim 27 has been amended to specify that the distributed feedback grating is incorporated with the epitaxial structure and extends in a longitudinal direction and terminates at longitudinal ends thereof.

In the Office Action, Claims 27, 28, 31, 32 and 37 were rejected as anticipated by the Kinoshita patent No. 6,330,265, and the remaining claims were rejected under 35 U.S.C. § 103 as unpatentable over Kinoshita. It is believed that with the amendment to the claims above to make explicit that which was implicit in the claims as originally presented, Kinoshita clearly does not anticipate any of the claims and further does not render the remaining claims obvious. The Kinoshita patent operates in an entirely different manner than applicants' invention and the structures disclosed in the Kinoshita patent cannot be modified to obtain applicants' claimed structure.

The office Action asserts that Kinoshita discloses "distributed Bragg reflector gratings 20, 21(A-E) incorporated with the epitaxial structure adjacent to distributed feedback grating 10 to reflect that light back to the distributed feedback grating 10 with structure blocking current flow through the Bragg reflector gratings, see Col. 27, line 4 – Col. 28, line 67." However, the structures labeled 20 and 21A in Kinoshita are not distributed Bragg reflector gratings. As is apparent from the cross-sectional views of the structures 20 and 21A, they are not <u>gratings</u> at all.

As explained in Kinoshita in Col. 6, beginning at line 66 and extending over to line 1 of Col. 7, "in the DFB laser shown here, a high-reflectivity structure 20 made up of InGaAsP <u>layers</u> and InP <u>layers</u> are made on an n-type InP substrate 12." (Emphasis added.) Further at Col. 7, lines 12-15 of Kinoshita, the structure 21 is described: "The high reflectivity structure 21, similarly to the high-reflectivity structure 20, may be made by alternately stacking InGaAsP layer and InP layers to form a <u>multi-layered</u> Bragg reflector." (Emphasis added.) Thus, there is no possible basis for the assertion that these structures constitute <u>gratings</u>.

The structures 20 and 21A are multi-layered reflectors which serve, as illustrated in Fig. 1, to reflect light vertically either back down to or up to the distributed feedback grating, but the structures 20 and 21A are clearly not diffraction gratings. While they may be called "Bragg" reflectors

because such multi-layered structures provide Bragg type reflection, such structures should not be confused with Bragg diffraction gratings which function in an entirely different manner. The multi-layer structures 20 and 21A do not meet the definition of distributed Bragg reflector gratings and therefore what is shown in Kinoshita lacks an element specified in Claim 27.

With regard to the assertion in the Office Action that Kinoshita discloses "structure blocking current flow through the Bragg reflector gratings, see Col. 27, line 4 – Col. 28, line 67," it is first noted that the cited language in columns 27 and 28 refers to Figs. 24A, 24B, 25A, 25B, 26A and 26B, and not to Figs. 1, 2A, 3, 4, 5 or 6 where the structures 20 and 21A-E are referenced. A claim cannot be anticipated by picking bits and pieces of different figures in a reference and combining them together. Whether or not picking features from different figures and combining them to meet the limitations of a claim may be pertinent to an obviousness rejection, it is clearly improper to do so in asserting that a claim is anticipated by the single reference.

In any event, a review of Figs. 24A-26B shows that those figures also clearly do not meet the requirements of Claim 27 or any of the claims depending thereon. As a reference to the text of Kinoshita will show, Fig. 24B is a cross-section perpendicular to the cross-section shown in Fig. 24A, Fig. 25B is a cross-section perpendicular to the cross-section of Fig. 25A, and Fig. 26B is a cross-section perpendicular to the cross-section shown in Fig. 26A. As clearly shown in these figures, these are ridge type devices in which the diffraction grating 202 and the wave guide portion 201 are in a ridge above the remainder of the structure, and as clearly shown in Figs. 24B, 25B and 26B, the electrode 255 is below the ridge so current flowing between the electrodes 255 and 270 cannot pass through the diffraction grating at all. There are clearly no distributed Bragg reflectors adjacent to each of the longitudinal ends of the distributed feedback grating. Furthermore, as is apparent from each of Figs. 24B, 25B and 26B, the current passing between the electrodes 255 and 270, as illustrated by the

arrows shown in these figures, <u>does in fact pass through</u> the multi-layered reflectors 204. The current confinement shown in these figures is to confine the current <u>laterally</u> to a stripe region, not to prevent current from flowing through distributed Bragg reflector gratings at the <u>longitudinal</u> ends of the grating. Thus, Kinoshita not only does not show distributed Bragg reflector <u>gratings</u>, it also doesn't meet the requirement of a Bragg reflector grating that current flow therethrough is blocked The structures shown in Figs. 24A-26B simply operate in a totally different manner than applicants' invention.

Finally, as is clearly seen in each of Figs. 24A, 25A and 26A, there is no spacing in the distributed feedback grating between adjacent grating elements at a position intermediate the ends of the grating that corresponds to a selected phase shift in the grating. Whether or not that feature is shown in any other of the figures of Kinoshita, it does not appear in these figures and thus these figures cannot anticipate Claim 27 for that reason also.

Claim 27 specifies in subparagraph (c) that the distributed Bragg reflector gratings are "adjacent to each of the <u>longitudinal ends</u> of the distributed feedback grating to reflect light back longitudinally to the distributed feedback grating." As is apparent from the figures of Kinoshita, including Fig. 1, the reflectors 20 and 21A (in addition to not being distributed Bragg reflector gratings) are not positioned adjacent to each of the <u>longitudinal</u> ends of the distributed feedback grating to reflect light back longitudinally to the distributed feedback grating. As clearly seen in Fig. 1 and other figures of Kinoshita, the reflectors 20 and 21A are <u>above</u> and <u>below</u> the distributed feedback grating 10, not at the longitudinal ends of the grating 10 (the longitudinal ends of the grating 10 as shown in Fig. 1 of Kinoshita are the edge faces of the laser). The reflectors 20 and 21A reflect light back vertically to the grating 10 rather than longitudinally, at a direction 90 degrees to the longitudinal direction of light reflection, as well illustrated by the vertical and longitudinal arrows shown in Fig. 1

of Kinoshita. As is apparent from reviewing the description in the Kinoshita patent (see, for example, the first paragraph of the Summary of the Invention), the purpose of the reflectors provided above and below the waveguide is to reflect light back to the waveguide with the advantage of obtaining favorable threshold characteristics even with second order gratings which are easier to fabricate than first order gratings (see Col. 2, lines 55-61, Col. 8, lines 56-63, and Col. 9, lines 15-25).

In contrast, in the present invention, the distributed Bragg reflector <u>gratings</u> are formed adjacent to the ends of the longitudinal distributed feedback grating to simultaneously obtain high efficiency and a high degree of guided-field uniformity. Applicants' structures have an entirely different purpose and a different objective than that set forth in Kinoshita, so that there is no suggestion in Kinoshita to modify its structures to obtain the features of either Claim 27 or the claims that are dependent thereon.

For the foregoing reasons, it is submitted that all of the claims remaining in the application should be in condition for allowance.

Respectfully Submitted,

Harry C. Engstrom, Reg. No. 26,876
Attorney for Applicants
Foley & Lardner
150 East Gilman Street
Post Office Box 1497
Madison, Wisconsin 53701-1497
(608) 258-4207
Fax: (608) 258-4258

Distributed Bragg Reflector

A device similar to distributed feedback lasers in construction and operation, but in which the periodic grating that produces feedback is removed from the gain section to simplify fabrication. The gratings at each end of the active region act as simple reflectors.

Source:
The Authoritative Dictionary of IEEE Standards Terms, 7th Ed. Piscataway, NJ: IEEE Press: Standards Information Network, 2000.

Thank you for visiting www.i-LEOS.org, your source for Lasers and Electro-Optics.
You can find us at: http://www.i-leos.org